0833

HIGH-Q

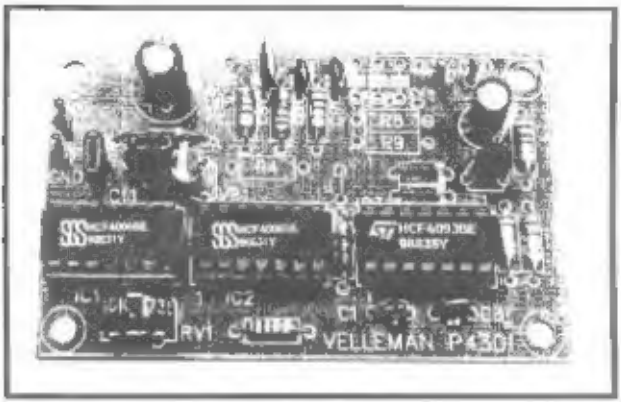
velleman-kit

# PINK NOISE GENERATOR

Skill level : 1

**K4301**

- Random digital noise
- 33 bit shiftregister
- Clockfrequency : adjustable between 30 and 100kHz
- Output : 150mVrms / Clock : 40kHz
- Output impedance : 1Kohm
- Pink noise filter : -3dB / oct. (20 . 0kHz)
- Easy adaptable for "white noise"
- PCB dimensions : 72 x 43mm (2.83" x 1.69")



# K4301 PINK NOISE GENERATOR

## INTRODUCTION

To analyze the acoustic properties of a room (usually a living-room), a good pink noise generator together with a spectrum analyzer (e.g. kit K4300) is indispensable. Moreover you need a microphone with as linear a frequency characteristic as possible (from 20 to 20000Hz ). If, in addition, you dispose of an equalizer (e.g. kit K4302), then you can not only check but also correct reproduction.

## TECHNICAL DATA

- Random digital noise.
- 33 bit shift register.
- Clock frequency adjustable between 30KHz and 100KHz.
- Output voltage: 150mV RMS./ clock frequency 40KHz.
- Output impedance: 1K ohm.
- Pink noise filter: -3 dB per octave (20 ... 20000Hz.).
- Easily adaptable to produce "pink noise".
- Power supply: 9 to 12VAC, or 12 to 15VDC / 5mA.

## PINK NOISE GENERATOR ASSEMBLY AND TOOLS

Check that you have all the parts.

### RECOMMENDED TOOLS

Miniature 25W soldering iron
Multicore solder
Soldering iron stand and sponge

## ASSEMBLY

### 1. WIRE JUMPERS

| Inventory | Sequence of assembly | Part number / description |
|---|---|---|
| ❍ | ❍ | Fit the wire jumper |

### 2. RESISTORS

Resistors are not polarized, so they can be inserted in either direction. Only the three primary color bands are mentioned. There may be a fourth band which can be ignored.

| Inventory | Sequence of assembly | Reference | Part number / description |
|---|---|---|---|
| ❍ | ❍ | R1 | 10K (brown, black, orange) |
| ❍ | ❍ | R2 and R3 | 100K (brown, black, yellow) |
| ❍ | ❍ | R5 | 47K (yellow, violet, orange) |
| ❍ | ❍ | R6 | 22K (red, red, orange) |
| ❍ | ❍ | R7 | 10K (brown, black, orange) |
| ❍ | ❍ | R10 | 220K (red, red, yellow) |
| ❍ | ❍ | R11 | 1K (brown, black, red, gold) |

3. DIODES

Align the banded end with the band drawn on the PCB board.

| Inventory | Sequence of assembly | Reference | Part number / description |
|---|---|---|---|
| ○ | ○ | D1 and D2 | 1N914 or 1N4148 type small signal diodes. The 1N4148 type may have a color code. In this case the large yellow band corresponds with the cathode. Pay attention to the polarity! |
| ○ | ○ | D3 | diode from the 1N4000 series. Pay attention to the polarity! |

4. SOCKETS

| Inventory | Sequence of assembly | Part number / description |
|---|---|---|
| ○ | ○ | Fit the three IC-sockets<br>Watch the notch ! |

5. PCB PINS

| Inventory | Sequence of assembly | Part number / description |
|---|---|---|
| ○ | ○ | Fit the pcb-pins for V, GND (2X), and OUT |

## 6. TRANSISTORS

A transistor has a flat side and rounded side. The flat side faces the same direction as the flat side drawn on the PCB board.

| Inventory | Sequence of assembly | Reference | Part number / description |
|---|---|---|---|
| ❍ | ❍ | T1 | BC547 type |

## 7. VOLTAGE REGULATORS

| Inventory | Sequence of assembly | Reference | Part number / description |
|---|---|---|---|
| ❍ | ❍ | VR1 | 78L08 type voltage regulator or equivalent |

## 8. TRIMMERS

| Inventory | Sequence of assembly | Reference | Part number / description |
|---|---|---|---|
| ❍ | ❍ | RV1 | 220K ohm trimmer |

## 9. CAPACITORS

These capacitors are not polarized, so they can be inserted either way.

| Inventory | Sequence of assembly | Reference | Part number / description |
|---|---|---|---|
| ❍ | ❍ | C1 | 680pF ceramic (sometimes marked n68) |
| ❍ | ❍ | C3 and C6 | 10nF ceramic (sometimes marked 103) |
| ❍ | ❍ | C7 | 4n7 ceramic (sometimes marked 472) |

| Inventory | Sequence of assembly | Reference | Part number / description |
|---|---|---|---|
| ○ | ○ | C5 | 22nF ceramic (sometimes marked 223) |
| ○ | ○ | C10 and C11 | 100nF sibatit (blue capacitor marked 100nS) |

## 10. ELECTROLYTIC CAPACITORS

Note carefully the positive leads before you fit the capacitor into the PCB board.
Pay attention to the polarity !

| Inventory | Sequence of assembly | Reference | Part number / description |
|---|---|---|---|
| ○ | ○ | C12 | 10uF electrolytic capacitor. Pay attention to the polarity! |
| ○ | ○ | C13 | 100uF electrolytic capacitor. Pay attention to the polarity! |

## 11. INTEGRATED CIRCUITS (IC)

| Inventory | Sequence of assembly | Reference | Part number / description |
|---|---|---|---|
| ○ | ○ | IC1 | CD4006, with its notch towards the PCB-edge |
| ○ | ○ | IC2 | CD4006, with its notch towards IC1 |
| ○ | ○ | IC3 | CD4093, with its notch towards IC2 |

Before you start testing, check the whole circuit thoroughly once more.

## TEST AND ADJUSTEMENT

- Turn trimmer VR1 to its center position.
- Connect a power supply, between points GND and V
a) when AC. 9 to 12 V
b) when DC. 12 to 15 V (battery or power supply)
  - to GND + to V
- Connect the output (OUT, GND) to the input of a spectrum analyzer, (e.g. K4300 LINE INPUT L or R) using a screened flex (screen to GND).
Remember : When using the same power supply for both the noise generator and the analyzer, you should connect the earth pin (GND) to only one device!
- Now adjust the noise signal using trimmer RV1 so as to obtain as flat a reproduction characteristic as possible. Especially pay attention to the higher frequencies (adjust spectrum analyzer sensitivity if necessary).
Remember : the nature of the lower frequencies (32 and 64 Hz) makes their read-out unstable.

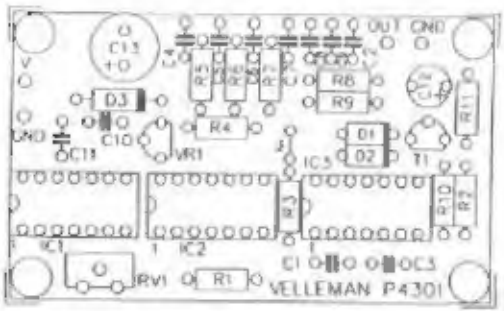
## USAGE

- Connect a microphone to the spectrum analyzer (microphone with as linear a reproduction characteristic as possible)
- Connect the noise generator to the input of an amplifier (e.g. the AUX input).
- Put the tone adjustments or equalizer settings in their center position
- Reproducing the noise via the loudspeakers now enables you to visualize the frequency characteristic of the listening-room (e.g. living-room) and possibly to adjust it using an equalizer until you get as flat reproduction as possible.

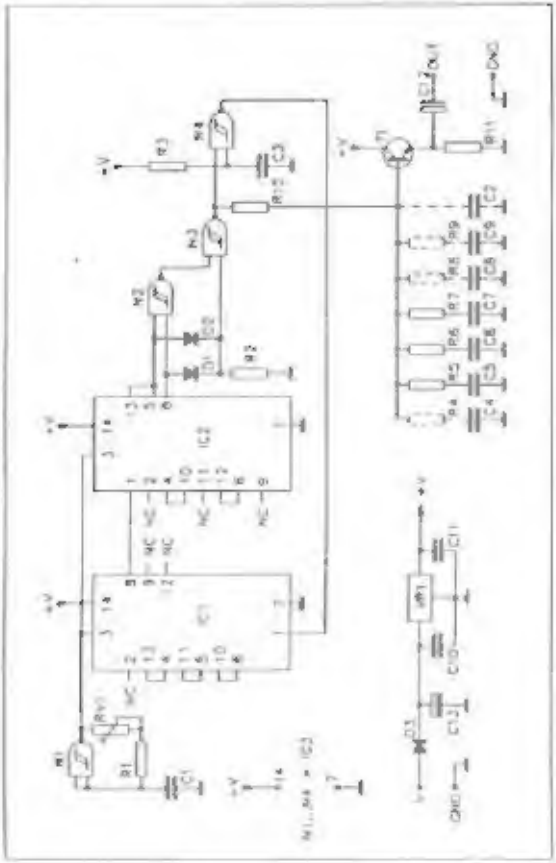
ATTENTION: when switching off and on the power supply too quickly, the noise generator may not want to "start". Therefore wait a few seconds to reconnect the power supply.

## FOR THOSE WHO LIKE TO EXPERIMENT

Room has been provided on the PCB to change the filter part of the noise generator if necessary, in order to be able to use the noise generator for other applications (e.g. sound-effects) and to adapt the "noise-sound" to your own taste.
By adapting C1 you can also modify the clock frequency (pin 3 of IC2) of the shift register (e.g. C1=18pF for a clock frequency up to and beyond 500KHz), so as to obtain a "white noise" at 500KHz and to adapt the filter (C2=100pF, do not fit C4 through C9). Output voltage will drop down to +/- 100mV RMS.
If at this clock frequency you want to obtain pink noise again then you should complete the filter. R4= 100Kohm, R8= 4K7, R9= 2K2, C4= 47nF, C8= 2n2, C9= 1nF, C2= 470pF (C5 through C7 must also be fitted). This will make output voltage drop down to +/- 30mV RMS.




Pink noise generator PCB layout and component placement



Pink noise generator Schematics